European Journal of Combinatorics 52 (2016) 245–247

Contents lists available at ScienceDirect

European Journal of Combinatorics

journal homepage: www.elsevier.com/locate/ejc

Preface

This volume of *European Journal of Combinatorics* is devoted to recent advances in Graphs and Analysis. It includes papers read at the second Workshop on Homomorphisms and Graph Limits, popularly known as the "Zámeček workshop". This workshop was held 23–27 January 2012 at Hraniční Zámeček, Hlohovec, located on the scenic margins of the Lednice ponds in the Czech Republic.

The fast growing area of graph (and structural) limits may be outlined as follows.

Limits of graph sequences can be defined in more than one setting. The case when the graphs are dense is best understood. In this case, convergence and limits were defined by Borgs, Chayes, Lovász, Sós, Szegedy and Vesztergombi (2006), and the ensuing theory shed new light on graph homomorphisms, Szemerédi's regularity lemma, quasi-random graphs, graph testing and extremal graph theory.

Much work has also been done on the limit of growing sequences of graphs with bounded degree. In fact, a limit object was first defined in this setting by Aldous in 1998 (for trees), and by Benjamini and Schramm in 2001 (for the general case). These studies highlighted strong connections with algebraic objects like amenable groups, geometric representations like circle packings, functional analysis, and other areas of mathematics.

Subsequently, research in graph limits became an inducement to step up the study of graph homomorphisms, in particular from the point of view of counting. Counting homomorphisms between graphs has a surprising number of applications. Many models in statistical mechanics and many questions in extremal graph theory can be phrased in these terms; as a consequence, the limiting values of many important graph parameters can be read off from limit objects. This is closely related to property testing problems in computer science.

http://dx.doi.org/10.1016/j.ejc.2015.07.008

The Zámeček workshop reflected the rapid developments taking place in the whole area of graph and structural limits. These developments have been documented by two recent books published since the workshop:

L. Lovász, *Large Networks and Graph Limits*, AMS, 2012,

J. Nešetřil, P. Ossona de Mendez, *Sparsity: Graphs, Structures and Algorithms*, Springer, 2012.

The pace of progress has also been reflected in two further conferences: "Graph and Hypergraph Limits", held 15–19 August 2011 at the American Institute of Mathematics in Palo Alto, and "Graphs and analysis", held 4–8 June 2012 at the Institute for Advanced Study in Princeton.

The photographs recall some of the moments from these meetings.

Although this volume contains papers related to the Zámeček workshop, several papers also include work done at the other two workshops. The selection of papers forms an expression of the depth and richness of the field.

The pleasant environment of Hraniční Zámeček inspired a working atmosphere that resulted in new cooperations and exchanges of ideas and in several advances in research. It also encouraged us to convene again for a third Zámeček workshop, planned for 2015. The workshop was supported jointly by the following grants: ELTE"DISCRETECONT" – project No. 227701 – László Lovász, CWI Amsterdam – Alexander Schrijver, DIMATIA, CE-ITI GAČR P202/12/G061 – Jaroslav Nešetřil.

László Lovász
Eötvös Loránd University, Budapest, Hungary
E-mail address: lovasz@cs.elte.hu.

Jaroslav Nešetřil
Charles University, Prague, Czech Republic
E-mail address: nesetril@iuuk.mff.cuni.cz.

Alexander Schrijver
CWI, Amsterdam, Netherlands
E-mail address: Lex.Schrijver@cwi.nl.

Available online 21 August 2015